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HIGH-FREQUENCY RADIO FADE-OUT ON OCTOBER 24, 1935

In the magazine Science for October 11, Dr. J. H. Dellinger of the Bureau reported the occurrence of fade-outs of high-frequency radio signals on March 20, May 12, July 6, and August 30. It was pointed out that the phenomenon was semiworld-wide, involving high-frequency radio transmission over the illuminated half of the globe and not the dark half. The time intervals between the occurrences varied from a little over 53 to a little over 55 days. The next interval of this approximate length terminated during the period October 21 to 25. A fade-out of modified form is now reported as having occurred on October 24. While this was 55 days after August 30, undue importance should not be attached to the approximate 54-day cycle. Similar fade-outs may have occurred but have gone unobserved at times half-way between, i. e., for each rotation of the sun.

The occurrence on October 24 was a wiping out of radio transmission above a certain frequency throughout the day in question. This obliteration of signals did not extend to as low values of frequency as in the previous cases, and was not as sudden, but it occurred under peculiar circumstances as regards sunspots and magnetic storms, and sheds new light on the relations of these phenomena. It is possible that one of the sudden fade-outs of the previously observed type also occurred; it was not observed in the United States, and whether it occurred elsewhere or at a time when no one was observing may never be known. The cause of all these phenomena is undoubtedly some eruption on the sun.

A remarkable increase in sunspot activity began on October 10, and this was accompanied by a general improvement in radio transmission on the higher frequencies. Amateurs and others found that they received excellent daytime signals on much higher frequencies than usual. By October 21 to 23 the upper limit of frequency had reached the highest value ever observed at the Bureau. Then, for a single day, October 24, this was completely reversed. The upper limit of frequency on this one day dropped to half its value on the preceding days. On October 25 and succeeding days it returned to the high previous values.

This was accompanied also by a remarkable change in the height of the upper ionized layer of the atmosphere which reflects radio waves. This height shot up to 290 miles on October 24 from a height of about 150 miles on the preceding and following days. Moreover, October 24 was a day of considerable magnetic disturbance. The radio effects were all at frequencies higher than those used for broadcasting. A technical report on this occurrence was published in the November issue of the Physical Review.

The significance of these phenomena lies in the definiteness of what happened. Scientists have long been puzzling over the connection between magnetic disturbances, sunspots, and radio transmission. Magnetic disturbances, sunspot activity, and poor high-frequency radio reception have been considered to go together, in general. There are many exceptions, and the October observations may help to work out this relation. They showed that in one respect at least high-frequency radio transmission was better as sunspot activity increased, and that it was suddenly impaired for a relatively short time. At the time of a radio fade-out there is doubtless some eruption on the sun much more sudden than the growth of a sunspot, which abruptly changes the rate at which the sun sends certain waves or particles into the earth's atmosphere. Such eruptions also produce magentic disturbances. There has hitherto been no way of identifying particular magnetic disturbances associated with such eruptions. The radio effects, on the other hand, are easily identified, and further study of them may furnish a means of closer insight into the mysteries of magnetic disturbances and other effects closely related to events on or in the sun.

A UNICONTROL RADIO RECEIVER FOR ULTRA HIGH FREQUENCIES

A new type of ultra high radio frequency receiver, which operates on a different principle from that usually used is described in the Journal of Research for December (RP856). The customary tuning condensers and coils between amplification stages are all eliminated and their place is taken by a special arrangement of brass tubes 20 inches long and about 1¾ inches in diameter with an inner concentric tube ⅞ inch in diameter. This construction is called a concentric transmission line. Tuning is made possible by a metallic plunger which slides up and down in each line. These plungers are ganged so that they may all be moved by one adjustment knob and they change the length of the lines by moving the ground to various positions along the lines. One end of each inner line is connected to the plate of one electron tube and the grid of the following electron tube. When the line is adjusted by means of the plungers to have an electrical length some value shorter than a quarter wave, it acts as a very high interstage coupling impedance and an amplification of 2 per stage may be obtained at 300 Mc/s (1 meter), 6 per stage at 200 Mc/s (2 meters), and over 16 per stage at 100 Mc/s (3 meters).

The 5 concentric lines used in a 4-stage amplifier and detector stand vertically and are arranged in a circle. The electron tubes (type 954) are in shielding compartments into which the lower end of each line terminates. Insulating rods attached to the plungers extend through the top end of each line. These are all connected to a common control knob with means for independent adjustment if desired.

The effective frequency (tuning) range of a receiver using line 20 inches (50 cm) long is from 300 Mc/s (1 meter) to 100 Mc/s (3 meters).

ELECTRICAL BEHAVIOR OF RUBBER

A paper on the electrical behavior of rubber has been prepared by A. T. McPherson, of the Bureau's staff, for publication as a chapter of the forthcoming monograph on rubber which will be issued by the American Chemical Society. This paper deals at some length with the four properties—dielectric constant, power factor, conductivity (or resistivity), and dielectric strength—which are commonly regarded as important in connection with the use of rubber for electrical insulation. The less familiar properties—frictional or triboelectrification, piezoelectrification, and electrostriction—are also treated, and mention is made of the magnetic permeability. The term "rubber" is broadly interpreted to include not only natural rubber and its vulcanized compounds, from soft rubber to ebonite, but also guttapercha, belata, artificial gums, synthetic rubber, DuPrene, and Thiokol. In the case of rubber-sulphur compounds detailed consideration is given to the relation between the electrical properties and the percentage of sulphur, the temperature, the pressure, and the magnitude and frequency of the applied potential. In connection with rubber-insulating compounds, at-

tention is paid to the effect of accelerators, antioxidants, fillers, and water as constituents of the rubber. Various other matters are dealt with, such as the effect of mechanical deformation, electrical stress, and aging on the electrical behavior.

EFFECT OF HUMIDITY IN HOT-WIRE ANEMOMETRY

A hot-wire anemometer consists essentially of a small electrically heated wire which may be exposed in an air stream, the speed of which is to be measured. Associated apparatus is required for controlling the heating current and measuring the rate of heat loss from the wire.

Before the hot-wire anemometer can be used to measure air speed, it must be calibrated by measuring the heat loss, or some related quantity, in a stream of known speed, such as that in a wind tunnel. It is the universal experience of those working with hot-wire anemometers that the calibration cannot be relied upon over long periods of time. Aside from such changes as may occur due to damaging the wire in handling, other changes of a seemingly erratic nature take place which are difficult to account for and have done much to discourage the use of the instrument in precise work.

It has recently been discovered by W. Paeschke, of the Kaiser Wilhelm Institut für Strömungsforschung that part of the erratic behavior is due to the effect of water vapor in the air, the heat loss from the wire increasing as the humidity increases. In an experiment recently conducted at the Bureau and described in the Journal of Research for December (RP850), the increase in heat loss was found to amount to about 2 percent for a relative humidity increase from 25 to 70 percent at 25° C. The effect is an important one, because if it is not taken into account an error of as much as 6 percent may be made in a determination of the air speed.

That humidity should have an effect is not surprising and, while only recently found by experiment, has long been suspected. If the theoretical relation between the heat loss and the air speed is considered, it is found that a change in the thermal conductivity of the air with humidity can account for the effect. The presence of a small amount of water vapor in the air is known to increase the thermal conductivity, and it is believed that the increased heat loss may be explained in this way.

INFRARED RADIATION FROM OTTO CYCLE ENGINE EXPLOSIONS

A paper under the above title will appear in forthcoming issues of Engineering (London, England).

This paper contains a detailed account of the improved apparatus used at the Bureau in making measurements of radiant energy to a wave length of 11 microns, emitted by explosions in the cylinder of a small L-head engine running on benzol and on blends of benzol with gasoline.

Observations made through five selective filters are recorded: Normal and knocking engine flames; blast-torch flames of liquid fuels; blowpipe flames of hydrogen, carbon monoxide, and city gas; the flame of gasoline burning on a wick; and a small black-body furnace heated to temperatures between 800° and 1,400° K.

For engine flames the results are presented in curves of dR/dt against crank angle, where R is the total radiation received by the measuring thermocouple up to time t from the beginning of an average cycle. A table is also included, giving the relative amounts of energy transmitted by the several filters from the various sources of radiation.

CHEMICAL CONSTITUTION OF LUBRICATING OIL

In the fall of 1933 the work of the American Petroleum Institute's research project 6 at the Bureau, which up to that time had been confined to the naphtha fraction of petroleum, was extended to include the lubricating-oil fraction. The object of the work is to determine what hydrocarbons are in the lubricating-oil fraction. The crude oil was distilled in vacuum in a semi-commercial unit. The fractions, consisting of about 1 gallon each, were then dewaxed by means of ethylene chloride, and the bulk of the asphaltic and resinous substances was removed by extraction with sulphur dioxide. The remainder of asphaltic and resinous substances and sulphur compounds was removed by silica-gel filtration. A "water-white" oil resulted from these operations. Further work has been confined to this "water-white" portion which has been fractionally distilled in high vacuum. This project is completely described in RP849 in the December number of the Journal of Research.

STABILITY OF AQUEOUS SOLUTIONS OF ACID POTASSIUM PHTHALATE

Tests described in RP852 in the Journal of Research for December show

that aqueous solutions of acid potassium phthalate stored in tightly stoppered flasks do not decompose under the conditions existing in the average chemical laboratory.

DETERMINATION OF STRESSES FROM STRAINS

When stresses in a material under load cannot be measured directly, as in a simple tensile test, for example, they may sometimes be determined indirectly by measuring strains. In the case of plane stress, such as exists in a plate subjected to forces acting in its plane, it is possible, by measuring the strains on four intersecting lines 45° apart, to determine very simply the maximum and the minimum stresses in the plane of stress and also their directions. In RP851 in the December number of the Journal of Research the equations for these stresses and their directions are given.

ACCELERATED SERVICE TESTS OF PINTLE BEARINGS

There is very little information available on the relative wearing qualities of the different materials which may be used for pintles or cups in lock-gate pintle bearings. Since some of the lock gates in the Tennessee River development, especially at the Pickwick Lock, are of rather large size and great weight, the War Department requested the Bureau to make accelerated service tests of pintle bearings using different combinations of materials, pressures, and conditions of lubrication. These tests are fully described in RP854 in the Journal of Research for December.

Pintles having a diameter of 26 inches and subjected to bearing pressures of 2,100 lb/in.^{2} are contemplated for use at this lock. The tangent of the angle between the axis of the pintle and the line of the resultant force on the pintle is about 0.4. The gates will swing through an angle of 70°, requiring about 1 minute for opening or closing. The pintle bearings will, of course, be under water. The estimated traffic through the lock may require the operation of the gates about 40 times a day. A life of 20 years, or 288,000 cycles, may be considered as satisfactory service.

The Bureau's tests were carried out under conditions simulating as closely as practicable those described above, with a pintle 1 inch in diameter. To secure results within a reasonable time, the tests were made at the rate of about 120 cycles per minute. The direction of the line of thrust and the angle of swing were the same as for the lock gate itself, and the pintle bearings were under water during the tests.

The results indicated that of the materials tested one of the materials must be phosphor bronze to give satisfactory service for pressures as great as 2,000 lb/in.^{2} Pintles of three types of monel metal gave satisfactory service at this pressure with phosphor-bronze cups.

Cup materials of stainless steel, chromium steel, chromium-nickel steel, malleable cast iron, and monel alloys were scored badly after only a few cycles when tested under a pressure of 2,000 lb/in.^{2} Aluminum-bronze cups were worn excessively at a comparatively small number of cycles. Phosphor bronze was the only cup material tested in this investigation which gave satisfactory service with pressures as great as 2,000 lb/in.^{2}

A stainless-steel pintle and phosphor-bronze cup provided with grooves for water circulation and tested under a pressure of 4,000 lb/in.^{2} withstood more than 288,000 cycles. A stainless steel pintle and phosphor-bronze cup lubricated with white lead or with grease having a lead-soap base and asphalt content did not fail when tested under a pressure of 6,000 lb/in.^{2} and subjected to more than 288,000 cycles.

EFFECT OF SURFACE TREATMENT ON PROPERTIES OF METALS

It is well recognized by materials-testing engineers that the measured properties of a metallic material may be decidedly influenced by the character of the surface of the test specimen. This is especially true for the fatigue or endurance limit of a metal. It is not so well known, however, that some surface *treatments* may also affect certain properties of a metal, at least as ordinarily determined. The effect appears to be most pronounced when the ratio of surface area to volume of metal is relatively large, as in wire. Recent endurance tests of wire by the pulsating tension method at the Bureau showed that an increase in the endurance limit of wire (galvanized and approximately 0.2 inch diameter) of over 100 percent was obtained by removing the surface metal, the thickness of the layer removed being equivalent to somewhat over 10 percent of the initial diameter. This is not an indictment, however, against any particular method of galvanizing.

PROTECTION OF HIGH-STRENGTH ALUMINUM ALLOYS AGAINST CORROSION

The commercial development of sheet material for building aircraft, consisting of a high-strength alloy sheet bearing a protective surface skin of pure aluminum, constituted one of the notable advances of the past decade in the aircraft-materials field. Following its first large-scale utilization, systematic periodic examinations have been made at the Bureau to determine the degree of reliability of this material under actual service conditions. The results of the latest examination confirm the early predictions based on laboratory experiments. Although the aluminum protective skin is not immune to corrosion, this very corrosion accomplishes a useful purpose. The protection afforded galvanized steel by the "sacrificial" corrosion of its zinc surface finds its counterpart in the protection of the underlying alloy by the aluminum. It has been observed that when, in certain spots, corrosion has entirely penetrated the aluminum coating, perforation of the sheet has not occurred, the electrolytic behavior of the aluminum coating being favorable to a lateral spreading of the corrosive attack rather than to deep penetration. While definite data on the ultimate useful life of the material are not yet available, it is plainly evident that this combination is very dependable from the standpoint of corrosion resistance under all ordinary conditions.

DETERMINATION OF GALLIUM IN ALUMINUM

Metallic aluminum commercially refined always contains small amounts of certain impurities. Among these is the element gallium, the only element other than mercury and cesium which is liquid at ordinary temperatures. Gallium is widely distributed in nature and has been found in many zinc blendes, iron ores, and in nearly all bauxites. Its determination is important because it finds its way into metallurgical products and causes errors in the gravimetric determination of such elements as vanadium, titanium, zirconium, beryllium, etc.

At the Bureau there have recently been developed two procedures for the determination of gallium in metallic aluminum. In one procedure gallium is separated from aluminum in sulphuric-acid solution by precipitation with the organic reagent cupferron, and finally determined indirectly in an oxide mixture containing vanadium, titanium, and zirconium. In the other procedure gallium is separated from aluminum in hydrochloric-acid solution by extraction with ether. The gallium in this instance is recovered by precipitation with cupferron and determined directly as gallic oxide, Ga_2O_3. These methods are described in detail in the Journal of Research for December, Research Paper 853.

HIGH-PURITY IRONS

A critical review of available scientific and technical information on the preparation and properties of various forms of high-purity irons has just been published by the McGraw-Hill Book Co., Inc., New York, N. Y. This book, The Metal—Iron, was prepared by two members of the Bureau's metallurgical staff with the assistance of experts on different phases of the subject. It is the Bureau's contribution to the program of the Research Committee on Iron Alloys of Engineering Foundation. The Metal—Iron is the sixth volume in the series of monographs, sponsored by the Iron Alloys Committee, which when completed will constitute a summary and critical review of all available information on iron and its important alloys.

INDEX OF REFRACTION OF SOME POTASH-SILICA GLASSES

Continuing the Bureau's work on the relation between certain properties and the composition of glass, 86 glasses of the potash-silica series were made, annealed, analyzed, and the index of refraction measured. The composition of the glasses ranged from approximately 15 to 40 percent potash, silica being the only other constituent present. They were made from the purest obtainable potassium carbonate and powdered quartz and were melted in platinum.

The index of refraction (for sodium light) changed from 1.5019 at 37 percent potash to 1.4804 at 17 percent. Although the actual refractivities of the potash-silica glasses are less than those of the corresponding soda-silica glasses (1.5076 and 1.4851) by approximately 0.005, it is interesting to note that the total change in each series is approximately the same (0.022).

If the refractivities of the potash glasses are plotted against their potash (or silica) content, it seems that the data can be represented by two straight lines intersecting at about 29 percent potash (71 percent silica) better than

by a continuous curved line. These two straight lines may be represented by the equations:

$$N=1.4676+0.00092K$$
$$N=1.4603+0.00118K'$$

in which N is the index of refraction of the glasses, K is a potash content greater than 29, and K' is less than 29 percent.

It must be noted, however, that extrapolation of the $=K'$ equation to 100 percent silica ($K'=0$) gives 1.4603 as the index of refraction of pure vitreous silica, a value 0.0016 greater than the measured value. This suggests another straight line somewhere between 85 and 100 percent silica, or necessitates some curvature in that range. That a straight line might be anticipated is suggested by previous data on the soda-lime-silica glasses (reported in BS J. Research 6, 933 (1931) RP320), because extrapolation to 100 percent silica of the data in that report gives the proper value for the index of refraction of vitreous silica.

NATURE OF THE GLASS PHASE IN HEATED COMMON CLAYS

A study has been made of the development and behavior of the glass phases in a glacial clay, an alluvial clay, and a shale when heated at various temperatures. The clays and shale were commercial raw materials used in the manufacture of face and common brick and red floor tile.

Shrinkage of the alluvial clay and shale specimens began with the formation of glassy bonds at cone 06. However, in the case of the glacial clay it was necessary to heat the specimens to cone 1 before the rather large quantity of dolomitic glass already formed became sufficiently fluid to cause shrinkage. The colors of the heated specimens were governed largely by changes which occurred in the glassy bonds during the heating process. The original yellow color of the iron-bearing clay grains in the unheated clays and shale became reddish brown after heating to cone 08. Higher temperatures caused increasing solution of such grains, saturating the glass phase with iron compounds. Four kinds of artificial minerals crystallized from the saturated glassy bonds. Precipitation of a red mineral from the glass bonds was noted in all of the specimens heated to cone 06. Because of their minute size, the optical properties of these red crystals have not been completely determined. The quantities of red crystals increased in the glassy bonds of the specimens of alluvial clay and shale with increasing temperature, reaching a maximum at cones 5 to 7. This was the temperature range of the development of the most intense red colors of the specimens. A decrease or entire disappearance of the red crystals was accompanied by a change of color of the specimens from red to gray or black, caused by the formation of a black glass. Factors causing the solution of red crystals were: Heating to cone 9 or more; reducing atmosphere; and the presence of glass of high lime and magnesia content. The glacial-clay specimens containing a large amount of dolomite failed to develop this red color. Microscopical examination showed that the red crystals were somewhat dissolved at cone 06 and almost completely dissolved at higher temperatures, with the precipitation of an unidentified green birefringent mineral. Its presence in large quantities produced an olive-green tint in the specimen heated to cone 1. The homogeneous glasses prepared by fusion of the clays and shale were black because of the high temperature required for fusing the materials and fining the resulting glasses. A green mineral resembling spinel crystallized from the glassy bonds in the alluvial clay and shale specimens heated to cones 8 to 9. Mullite was also found in these glasses.

Of the three glasses resulting from fusion of the three materials, that made from the alluvial clay contained the most silica, had the lowest refractive index and coefficient of expansion, and had the highest softening point. The properties and chemical composition of the glass resulting from fusion of the shale were intermediate between those resulting from the fusions of the alluvial and glacial clays.

THE SYSTEM: K_2O-PbO-SiO_2

This supplements the report published in Technical News Bulletin 211 (November 1934). The additional study of this system indicates that it contains four ternary compounds having the molecular ratios 1:2:2, 1:4:8 (previously reported as 1:3:6), 1:1:4, and 2:1:3, respectively, with the possibility of a fifth. The first, crystallizing as hexagonal plates with a melting point at 918° C is uniaxial negative, has indices ω 1.93 $\pm$0.01, ϵ 1.72 $\pm$0.01, and the optic axis is perpendicular to the cleavage. The second, crystallizing as well-defined fibers or lathes, melting at 779°, and resembling a short-fibered asbestos when crushed, has indices ranging from

1.69 ±0.01 to 1.79 ±0.01, extinction is parallel, and the optic axis is parallel with the longitudinal axis. The third is positive biaxial, crystallizes as rectangular, platy granules of parallel extinction which melt at 757°; the optic angle is about 75° and the indices: α 1.590, β 1.612, γ 1.65. (All indices ± 0.005). The fourth is platy with an average index of approximately 1.67 and melts incongruently at 737° and is very unstable.

The index of refraction, linear thermal expansion to 300° C, and the softening temperature, of the first three compositions, as glasses, are respectively: 1.775, 0.46 percent, and 395° C; 1.712, 0.28 percent, and 460° C; and 1.606, 0.36 percent, and 463° C. The 2:1:3 compound composition is very unstable as a glass.

ACCELERATED AGING TEST FOR WEIGHTED SILK

The rather rapid deterioration of some silk, and particularly weighted silk fabrics in storage and as a result of exposure to light, heat, and moist air, has for years been a source of trouble for manufacturers, distributors, and users. The rate of deterioration cannot be predicted simply from the amount of weighting or other substances present on the silk. A laboratory test which will indicate the relative stability of silks is needed. A study of the aging of silk recently completed in the textile section of the Bureau has led to a proposed accelerated aging test, which is fully described in the December number of the Journal of Research (RP855).

The Bureau has studied the loss in breaking strength of a variety of silk and weighted silk cloths resulting from: Storage in the dark; exposure to daylight received through a north window (natural aging), and exposure to radiation from the glass-enclosed carbon-arc lamp under controlled conditions of temperature and relative humidity (accelerated aging). General agreement was found in the results of natural and accelerated aging of fabrics which deteriorate at considerably different rates.

The accelerated aging test was applied to silk dress fabrics purchased in stores in different parts of the country. The strength after aging of the 9 fabrics containing less than 10 percent of nonfibrous materials varied from 87 to 42 percent of the original strength. The strength of the 13 weighted silks in the lot varied from 65 to 22 percent of the original strength.

The proposed accelerated aging test is as follows: Specimens of the cloth suitable for warp and filling breaking strength tests are exposed for 20 hours to the radiation from a glass-enclosed carbon-arc lamp, such as the Fade-Ometer, operated on direct current of approximately 13 amperes with approximately 140 volts across the arc. The distance from the specimens to the center of the arc is 15 inches. The specimens are enclosed in a cabinet glazed with window glass approximately one-eighth inch thick between the specimens and the arc. The air in the cabinet is maintained at 75 to 77 percent relative humidity and 63 to 67° C. The breaking strength of the cloth after exposure, expressed as a percentage of the breaking strength before exposure, in the direction, warp or filling, showing the greater change in strength is taken to be indicative of the probable relative stability of the fabric with respect to exposure to light, heat, and moist air.

COMMERCIAL STANDARD FOR MOHAIR FABRICS

With the purpose of recording standard requirements for mohair pile fabrics so as to give all manufacturers, distributors, and users a worth-while objective without being restrictive, the National Upholstery Textile Association, Inc., requested the cooperation of the Bureau in the establishment of a commercial standard for this type of fabric. It is not expected that a commercial standard will eliminate the manufacture of subquality material, but it is expected that the certification of quality on the basis of such a commercial standard will stop the undesirable trend toward lower quality and turn it in an upward direction.

The recommended commercial standard as approved by the general conference on June 14, 1935, has been accepted as a commercial standard by producers, distributors, and users of mohair pile fabrics and manufacturers and distributors of upholstered furniture.

The resulting commercial standard, CS52–35, now available in printed form, provides each of three types of mohair pile fabrics, namely, 100-percent mohair plain velvet, 100-percent mohair plain frieze, and 50-percent mohair plain frieze. It also sets minimum requirements for the number of tufts (a tuft being described as the two exposed ends of a pile loop) per square inch in mohair velvet and the number of loops per square inch in the friezes; the minimum weight of the pile per

yard of fabric 54 inches wide for each type of fabric; sets color-fastness requirements; requires that the fabric shall be treated with a satisfactory moth-repellant material; permits a minus tolerance of 1 percent in the 50-percent mohair frieze; outlines test methods to determine the above requirements, and records the wording of a certificate to be used on tags or labels to inform the buyer that the fabric conforms to the quality requirements of the commercial standard.

The pamphlet includes a brief history of the project, a list of the official acceptors, and the membership of the standing committee. The standard became effective as a basis for labeling of fabrics complying therewith on July 8, 1935. Copies are available from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

COMMERCIAL STANDARD FOR FIBER INSULATING BOARD

The second edition of the Commercial Standard for Fiber Insulating Board, CS42–35, now available in printed form, represents reaffirmation of Commercial Standard CS42–32 with an amendment which permits drying the board to constant weight at 160° F. instead of 220° F as formerly required. The lower temperature is to be used only with boards which are injured by the higher temperature. With respect to other methods of test and all requirements, the reaffirmed standard follows the original specification which was developed by a group of manufacturers who were desirous of establishing a nationally recognized quality standard for the guidance of the architect, builder, and prospective home owner, and which became effective as a commercial standard September 15, 1932.

The commercial standard is a minimum specification embodying the important characteristics of a satisfactory insulating board, chief among which is maximum thermal conductivity set at 0.36 btu per hour per square foot, per degree F, per inch thickness. Since this class of board is used structurally as well as for its insulating value, strength is an important characteristic, and, therefore, tensile and deflection requirements and maximum water absorption are included in the commercial standard.

The thermal-conductivity tests are based on part II, Conductivity of Homogeneous Materials, of the Standard Test Code for Heat Transmission Through Walls, as adopted by the American Society of Heating and Ventilating Engineers.

Reaffirmation, with amendment, was announced June 24, 1935.

Copies of this publication are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

TRANSPARENT WRAPPING MATERIALS

The wide-spread use of transparent wrapping materials in sheet form for packaging purposes has resulted in numerous inquiries regarding the nature of these materials. This information has been gathered together in Bureau Letter Circular LC455, which contains: Methods of manufacture (described in terms suitable for the reader not familiar with modern plastics), properties, and uses. References in the literature to detailed or specific information are included. The materials described include regenerated cellulose, cellulose acetate, and rubber hydrochloride.

NEW AND REVISED PUBLICATIONS ISSUED DURING NOVEMBER 1935

Journal of Research[1]

Journal of Research of the National Bureau of Standards, vol. 15, no. 5, November 1935 (RP nos. 840 to 848, inclusive). Price 25 cents. Obtainable by subscription.

Research Papers[1]

(Reprints from the September 1935 number of the Journal of Research)

RP822. An extensometer comparator. Ambrose H. Stang and Leroy R. Sweetman. Price 5 cents.

RP823. Purification of gallium by fractional crystallization of the metal. James I. Hoffman and Bourdon F. Scribner. Price 5 cents.

RP824. Present status of the isolation and identification of the volatile hydrocarbons in a midcontinent petroleum. Robert T. Leslie and Joseph D. White. Price 5 cents.

RP825. Heats of vaporization of eight gasolines. Ralph S. Jessup. Price 5 cents.

RP826. Mechanical properties of cotton yarns. Herbert F. Schiefer and Daniel H. Taft. Price 5 cents.

RP827. A study of sagger clays and sagger bodies. Raymond A. Heindl. Price 5 cents.

RP828. Effects of fumigants on paper. Charles G. Weber, Merle B. Shaw, and E. A. Back. Price 5 cents.

See footnote on following page.

RP830. Infrared absorption spectra of plant and animal tissue and of various other substances. R. Stair and W. W. Coblentz. Price 5 cents.
RP831. Tests of steel tower columns for the George Washington Bridge. Ambrose H. Stang and Herbert L. Whittemore. Price 10 cents.

Simplified Practice Recommendations[1]

R158–35. Forged axes. Price 5 cents.
R159–35. Forged hammers. Price 5 cents.
R160–35. Forged hatchets. Price 5 cents.

Commercial Standards[1]

CS42–35. (2d ed.) Fiber insulating board. Price 5 cents.
CS52–35. Mohair pile fabrics (100-percent mohair plain velvet, 100-percent mohair plain frieze, and 50-percent mohair plain frieze). Price 5 cents.

Technical News Bulletin[1]

Technical News Bulletin 223, November 1935. Price 5 cents. Obtainable by subscription.

LETTER CIRCULARS

It is the intent of the Bureau to distribute single copies of these Letter Circulars on request only to those parties having special interest in the individual Letter Circular. Economy necessitates limitation in the number of copies issued. It is not the intent to supply parties with a copy of each Letter Circular issued during the month. Letter Circulars are necessarily of a temporary nature designed to answer numerous inquiries on a given subject. Request should be addressed to National Bureau of Standards.

LC450. Railway track scale testing service of the National Bureau of Standards, fiscal year 1935 (July 1, 1934, to June 30, 1935).
LC451. Publications on fiber structure and industrial utilization of waste land products.
LC452. Sound absorption coefficients of the more common materials. (Supersedes LC425.)
LC453. Methods of using standard frequency radio emissions. (Supersedes LC437.)
LC454. Hues of the spectrum colors.

OUTSIDE PUBLICATIONS[2]

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